

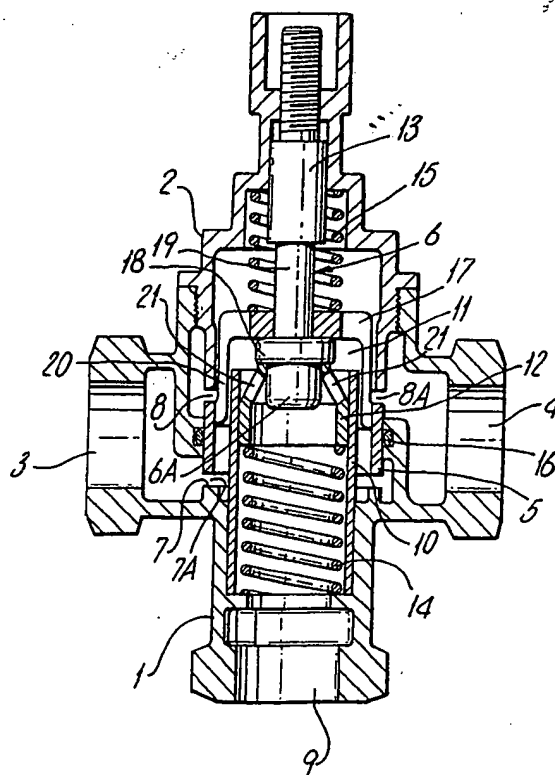
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(54) Thermostatic mixing valve

(57) The valve comprises a valve casing (1) having inlets (3, 4) for the hot and cold liquids respectively, a discharge (9) for the combined liquid, a control valve (5) for controlling liquid flows through the inlets (3, 4), and a thermostat (6A) responsive to the temperature of the combined liquids to regulate movement of the control valve (5). A mixing tube (10) is

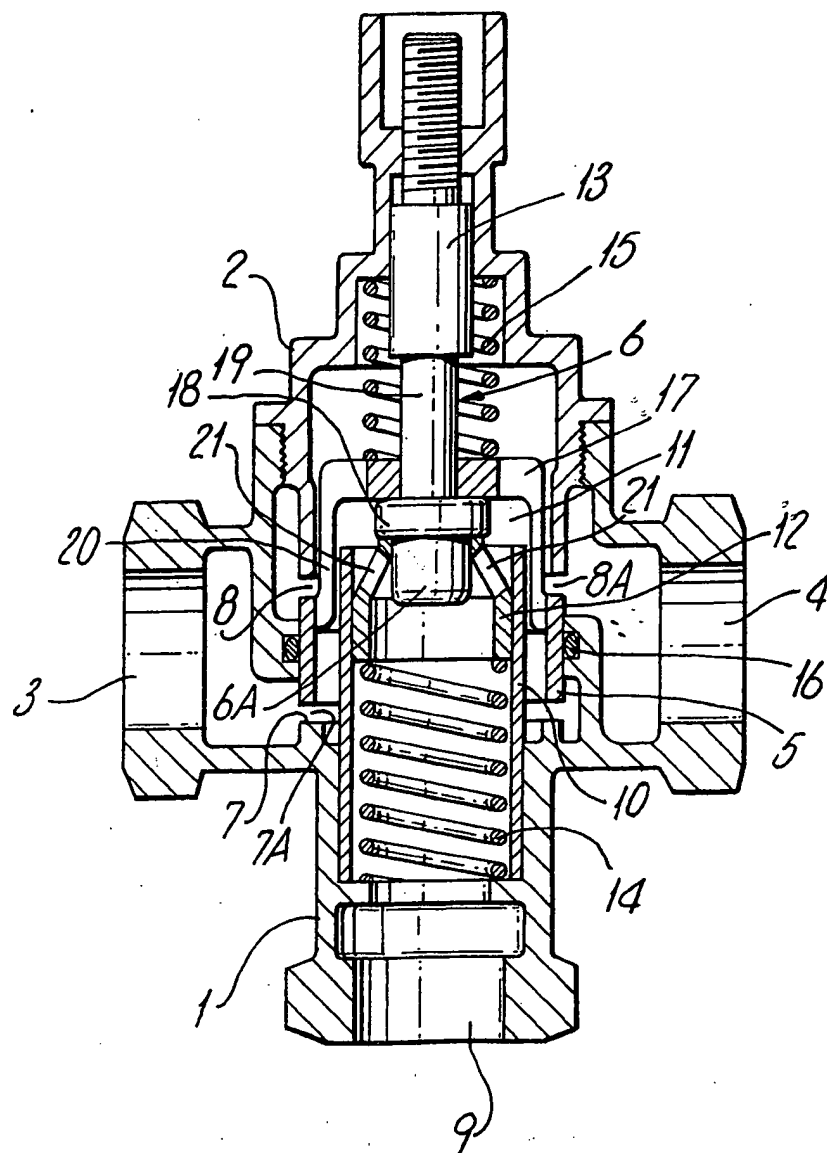
provided within the casing (1) providing a first passage (20) for the liquids leading to a mixing chamber (11), and a second passage (21) oppositely directed to the first passage (20) to lead the mixed liquids to the thermostat (6A); this arrangement enables the blending valve to be of compact size while enabling proper mixing of the liquids and thereby satisfactory temperature control.



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SPECIFICATION

Improved thermostatic mixing or blending valve

The present invention relates to thermostatic mixing valves for mixing or blending hot and cold liquids to deliver mixed liquid at a desired temperature, the mixing valve including valve means controlled by a thermostat which is responsive to the temperature of the blended liquid to control the hot and cold flows into the valve. Such a mixing valve is hereinafter referred to as a mixing valve of the type aforesaid.

For accuracy of temperature control in a mixing valve of the type aforesaid, it is desirable that the incoming hot and cold liquid flows are thoroughly mixed before passing over the thermostat of the valve so that the thermostat always receives the correct temperature signal to adjust the hot and cold inlet flows to maintain the correct temperature of the mixed liquid (water) at the valve outlet.

A previous mixing valve had the disadvantage that the flow path of the mixed liquid prior to the thermostat was unsatisfactory and particularly relatively short and mitigated against an accurate temperature signal of the mixed liquid. To avoid or minimise this disadvantage the present applicants previous mixing valve as described and claimed in U.K. Patent 1294496 utilised a thermostat of relatively greater length located in an elongate outlet chamber for mixed fluid. It is an object of the present invention to provide a mixing valve giving accurate temperature control which can be of relatively compact size.

According to the present invention a mixing valve of the type aforesaid includes duct means defining a flow path for combined liquid flow to the thermostat, said duct means including means to change the direction of the combined liquid flow to promote thorough mixing of the combined liquids.

Preferably the combined flow in a second duct portion is substantially opposite to that in a first duct portion.

In a preferred embodiment, the valve means comprises a tubular slide valve, and a cylindrical mixing element is positioned concentric with the slide valve but radially inwardly thereof, the arrangement being such that said first flow portion is on the outer side of said mixing element, while the second flow portion is in the interior of the element.

An embodiment of the present invention will now be described by way of example with reference to the accompanying drawing which shows a cross-sectional elevation of a thermostatic mixing valve according to the present invention. The mixing valve comprises a tubular main valve casing 1 closed at one end by end cover 2, a hot water inlet 3, a cold water inlet 4 and a mixed water outlet 9. A tubular slide valve 5 bearing on sealing ring 16 moves towards a hot water valve seat 7 or oppositely to the facing cold water valve seat 8 for control of flow through the

hot and cold inlet ports 7A, 8A. Movement of the slide valve 5 is controlled by thermostatic actuator 6 having thermo-responsive element 6A stirrup 17 of valve 5 being slidable on a stem portion 19 of actuator 6 and supported by collar 18 of the actuator.

In the present valve, the flow path of mixed water to the element 6A is fashioned by inner mixing tube 10 concentric with slide valve 5. Thus a first flow portion 20 for mixed water is present on the outer side of tube 10 while a second following portion 21 is located within the tube 10. 11 is a water mixing chamber between portions 20, 21. Element return spring 14 urges thermostat element support 12 against collar 18, while slide valve return spring 15 is located between the stirrup 17 and the end cover 2. Temperature setting is achieved by temperature adjusting screw 13.

Hot water enters by the hot inlet 3 and cold water enters by the cold inlet 4. The slide valve 5 actuated by thermostat actuator 6 moves between the hot valve seat 7 to control the inlet flow of hot water and the cold valve seat 8 to control the inlet flow of cold water. The position of the slide valve 5 determines the amount of hot water and cold water entering the valve and, therefore, determines the temperature of the mixed water leaving the valve at the outlet 9. The position of the slide valve 5 is controlled by the expansion or contraction of the thermostat 6 and the expansion or contraction of the thermostat 6 depends upon the temperature of the water surrounding the thermostat 6A. Hot water entering the valve through the hot inlet 3 passes between the slide valve 5 and the hot valve seat 7 then up inside the slide valve round the outside of the mixing tube 10 to meet cold water entering by the cold inlet 4 and between the slide valve and the cold valve seat 8. Both hot and cold water continue to pass up outside the mixing tube 10 via portion 20 and then turn through 180 deg. in the mixing chamber 11 before passing along portion 21 through ports in the thermostat element support 12 and then across the thermostatic element 6A of the actuator 6. The mixing tube 10 ensures that the hot water and cold water entering the mixing valve must pass along the outside of the mixing tube 10 and then pass back through the inside of this tube. By this arrangement, the hot water and cold water are thoroughly mixed before passing across the thermostat element 6A. The thermostat element 6A, therefore, receives the correct temperature signal and the mixed water temperature is more accurately controlled than is the case in previous mixing valves which did not have the present mixing tube 10. The thermostat actuator 6 is held against the temperature adjusting screw 13 by means of the element return spring 14. The element return spring also acts as an overheat spring and can absorb over-expansion of the element 6A once the slide valve has closed against the hot valve seat 7 and if there should be a further rise in temperature. The slide valve return spring 15

holds the slide valve in contact with the thermostat elements 6A and will make the slide valve follow the element upon a rise in temperature when the element expands or, conversely, when the element contracts: the element return spring 14 will force the actuator 6 upwards together with the slide valve and compress the slide valve return spring 15.

CLAIMS

- 10 1. A thermostatic mixing valve for mixing or blending relatively hot and cold liquids to deliver mixed liquid at a desired temperature; the valve including valve means controlled by a thermostat which is responsive to the temperature of the
- 15 blended liquids to control the hot and cold flows into the valve, and duct means defining a flow path for combined liquid flow to the thermostat, said duct means including a control element defining a first non-tortuous passage into which
- 20 the relatively hot and cold flows are separately introduced, and a second passage in which the thermostat is located and which receives the mixed hot and cold liquids flow from the first passage, said control element causing a change in
- 25 the direction of flow of the combined liquids between the first and second passages to promote

thorough mixing of the combined liquids.

2. A mixing valve as claimed in claim 1, wherein said control element provides a combined
- 30 flow in the second passage substantially opposite to that in the first passage.

3. A mixing valve as claimed in claim 2, wherein the valve means comprises a tubular slide valve, and a cylindrical mixing element is
- 35 positioned concentric with the slide valve but radially inwardly thereof, the arrangement being such that said first flow passage is on the outer side of said mixing element, while the second flow passage is in the interior of the element.

- 40 4. A mixing valve as claimed in claim 3 wherein said cylindrical mixing element surrounds the thermostat of the valve.

5. A mixing valve as claimed in claim 3 wherein the mixing element surrounds a spring urging the
- 45 thermostat in one direction by means of a movable thermostat support which is apertured to permit combined flow in said second passage onto the thermostat.

6. A mixing valve as claimed in claim 2 wherein
- 50 a mixing chamber is provided between said first and second passages.

7. A thermostatic mixing valve substantially as hereinbefore described with reference to and as illustrated in the accompanying drawing.